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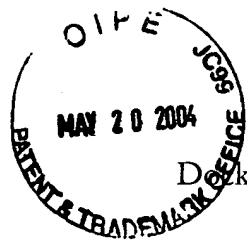
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Document No.: KC-0110

PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of : **OFFICIAL DRAFTSMAN**  
Richard Keith BOOTH :  
Serial No.: 10/781,937 : Group Art Unit: 3672  
Confirm. No.: 9705 :  
Filed: February 20, 2004 : Customer No.: 34610  
For: DOWNHOLE TOOL :

**TRANSMITTAL OF CERTIFIED PRIORITY DOCUMENT**

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Sir:

At the time the above application was filed, priority was claimed based on the following application:

United Kingdom Patent Application No. 0303862.7 filed February 20, 2003

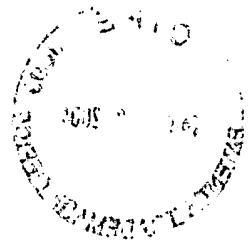
A copy of each priority application listed above is enclosed.

Respectfully submitted,  
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**Date: May 20, 2004**

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INVESTOR IN PEOPLE

The Patent Office  
Concept House  
Cardiff Road  
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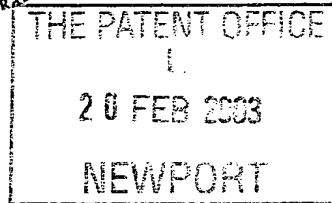
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20 FEB 03 0756312-2 025735  
P01/7700 0.00-0303862.7

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Cardiff Road  
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1. Your reference

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2. Patent application number

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0303862.7

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Hamdeen Incorporated Limited  
Vannin House  
Laxey  
ISLE OF MAN  
IM4 7AH

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

8570533001

4. Title of the invention

Downhole tool

5. Name of your agent (if you have one)

Kennedys Patent Agency Limited

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Floor 5, Queens House  
29 St Vincent Place  
GLASGOW  
G1 2DT

Patents ADP number (if you know it)

8058240002

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

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Date of filing  
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

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Claim(s) -

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12. Name and daytime telephone number of person to contact in the United Kingdom

Arlene Campbell

Tel: 0141 226 6826

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1    Downhole Tool

2

3    The present invention relates to downhole tools for use  
4    in the oil and gas industry and in particular, though not  
5    exclusively, to a tool including blades to condition, by  
6    grooming, the inside walls of casing or liner used in a  
7    well bore.

8

9    In a cased or lined well bore it is necessary to remove  
10   debris and other particulate matter from the inner wall  
11   of the casing or liner before performing certain  
12   operations in the well bore such as setting a packer or  
13   running a completion. Such conditioning of the well bore  
14   is generally provided by brushing or scraping the inner  
15   wall of the casing or liner. The aim being to provide a  
16   smooth clean surface upon which a seal can reliably be  
17   made.

18

19   It is known in the art to provide brushes on the outer  
20   surface of a cylindrical body mounted in a work string,  
21   to 'brush' debris from the inner wall of casing or liner  
22   as the string is run or removed from the borehole. Such  
23   brushes have limited application downhole as, due to the

1 'wet' environment in which they must work, they are prone  
2 to clogging.

3  
4 Scrapers have also been arranged on a cylindrical body  
5 mounted in a work string. These are generally spiral  
6 metal blades which scrape against the inner wall of the  
7 casing or liner. They must be perfectly sized to match  
8 the casing or liner in use and can damage the surface of  
9 the liner or casing if grit becomes trapped between the  
10 outer edge of the blade and the inner wall of the casing  
11 or liner.

12  
13 To overcome these disadvantages, scrapers made of rubber  
14 materials have been developed which reform within the  
15 casing to cover any mismatch in size and provide a  
16 'wiper' to the casing or liner wall. Unfortunately,  
17 rubber has a limited life span as it wears quickly in  
18 downhole environments.

19  
20 It is an object of at least one embodiment of the present  
21 invention to provide a downhole tool for conditioning a  
22 casing or liner wall which obviates or mitigates the  
23 disadvantages of the prior art.

24  
25 It is a yet further object of the present invention to  
26 provide a downhole tool which can be used when the work  
27 string is rotated, run in or pulled out of the well bore.

28  
29 According to a first aspect of the present invention  
30 there is provided a downhole tool for conditioning a  
31 casing or liner wall, the tool comprising a substantially  
32 cylindrical body connectable in a work string, a sleeve  
33 located around the body, one or more blades located on

1 the sleeve, wherein each blade has a circular peripheral  
2 edge distal to the sleeve and each blade is manufactured  
3 from a composite material which comprises a polymeric  
4 fibre.

5  
6 Preferably the polymeric fibre is chosen from the group  
7 comprising polyaramid fibres, polyethylene fibres,  
8 polypropylene fibres, polyacryl fibres, polyester fibres,  
9 polyacryl fibres or poly{2,6-diimidazo[4,5-b4',5'-  
10 e]pyridinylene-1,4(2,5-dihydroxy)phenylene} (PIPD)  
11 fibres.

12  
13 Preferably the polyaramid fibres are produced from poly-  
14 paraphenylene terephthalamide commonly referred to by its  
15 trade name Kevlar® or Twaron®.

16  
17 Preferably the polyethylene fibres are those commonly  
18 referred to as Dyneema® or Spectra®.

19  
20 Preferably the polyester fibres are those commonly  
21 referred to as Diolen®.

22  
23 Preferably the poly{2,6-diimidazo[4,5-b4',5'-  
24 e]pyridinylene-1,4(2,5-dihydroxy)phenylene} (PIPD) fibres  
25 are commonly referred to as M5®.

26  
27 Composites including polymeric fibres provide a blade  
28 which both has a degree of flexibility and sufficient  
29 abrasion resistance to successfully 'knock-off' debris  
30 from the casing or liner wall and cope with small  
31 mismatches between the blade diameter and the inner wall  
32 diameter. This allows the blades to be sized to the  
33 actual casing ID (Inner Diameter).

1

2 By providing a complete uninterrupted circular peripheral  
3 edge to the blade, maximum strength across the blade is  
4 achieved while additionally the blade can provide a  
5 cleaning action without the need to rotate the blade  
6 within the well bore.

7

8 Preferably the composite comprises KEVLAR®. Preferably  
9 also the composite further includes carbon. Preferably  
10 also the composite includes glass fibre. Thus in the  
11 preferred embodiment the blades are made from a KEVLAR®  
12 carbon glass composite.

13

14 Preferably the sleeve is adapted to rotate independently  
15 of the body. Thus the body can rotate with the work  
16 string while the sleeve may remain static. This may be  
17 referred to as a 'through rotational mandrel'.

18

19 Preferably the sleeve includes a plurality of bypass  
20 ports to allow fluid to pass between the sleeve and the  
21 tool. More preferably there are pairs of bypass ports,  
22 each bypass port of each pair being arranged on either  
23 side of the one or more blades to provide an entry bypass  
24 port and an exit bypass port respectively. This  
25 arrangement provides a bypass around the blade(s).

26

27 Preferably one or more channels are located on an outer  
28 surface of the body. More preferably the channel(s) align  
29 with the ports so bypassing fluid can travel through the  
30 channel(s). This provides a flow through area to the tool  
31 in use.

32

1

2 Alternatively one or more ports may be located through  
3 the one or more blades, the ports being distal from the  
4 peripheral edge of the blade(s). Thus a fluid bypass is  
5 provided through the blades without interfering with the  
6 360 degree grooming action on the wall of the  
7 casing/liner.

8

9 Preferably the sleeve includes one or more jetting ports.  
10 Preferably the jetting ports include nozzles.

11 Advantageously the jetting ports are arranged adjacent  
12 the blades so that fluid bypassing the blades jets from  
13 jetting ports to provide a cleaning action on the blades.

14

15 Preferably the blades are located between flexible  
16 members. This allows additional substantially  
17 longitudinal movement of the blades and provides spacers  
18 for use between the blades. This arrangement provides  
19 blades which are not radially biased. The blades may  
20 further be mounted on a cartridge which is located on the  
21 body. This arrangement allows easy interchange of the  
22 blade configuration without the need to handle individual  
23 blades. Additionally the cartridge may be radially  
24 biased.

25

26 Advantageously the blades may be arranged in sets of  
27 groups on the sleeve. By providing groups of blades  
28 together the blades support each other to give a strength  
29 equivalent to use of a thicker blade, while maintaining  
30 the flexibility achieved by each narrow blade.

31

32 Preferably the blades have an inner circumferential edge  
33 such that they form a torus, sometimes referred to as

1 'do-nut' shaped. Preferably also a diameter of the blade  
2 at the inner circumferential edge is greater than an  
3 outer diameter of the body at the location of the blade  
4 on the body. This mismatch may provide a clearance so  
5 that the blade may move radially with respect to the  
6 body. The blades may therefore 'retract' towards the  
7 tool, away from the low side of the casing/liner, if the  
8 tool is used in horizontal or deviated casing. This can  
9 protect the blades, so they don't bear the weight of the  
10 tool, if a stabiliser or centraliser, preferably sized to  
11 drift, is present. Advantageously, the blade may be  
12 radially biased by a spring or the like against the body.  
13

14 Preferably the tool includes one or more additional  
15 sleeves. Advantageously these additional sleeves are  
16 centralisers as are known in the art to assist in keeping  
17 the tool centrally aligned in the casing or liner. Thus  
18 the additional sleeves may comprise a plurality of raised  
19 portions on an outer surface thereof. Preferably the  
20 raised portions are arranged equidistantly around the  
21 outer surface of the additional sleeve(s).  
22

23 Advantageously the sleeve(s) are held to the tool body by  
24 one or more holding devices to prevent longitudinal  
25 movement of the sleeve(s) on the tool body. Preferably  
26 each sleeve abuts another sleeve or a stop on the tool  
27 body. An opposite end of a sleeve may then be held in  
28 place by the holding device. Preferably the holding  
29 device comprises a split ring, a retaining ring and a  
30 circlip.  
31

32 Preferably the holding device is located around the body  
33 and abuts the sleeve. The split ring preferably rests

1 against an end of the sleeve and comprises two  
2 semicircular members. The split ring bears the load of  
3 the sleeve. Preferably the retaining ring comprises a  
4 circular member including a circular groove located at a  
5 first end thereof. More preferably the split ring  
6 locates in the groove such that the split ring is  
7 retained by the retaining ring. Preferably the circlip is  
8 located at a second end of the retaining ring. The  
9 circlip holds the retaining ring in place and bears no  
10 load from the sleeve. By taking the load of the sleeve on  
11 the split ring, this load is transferred to the body.

12  
13 Preferably the tool may include an additional operating  
14 portion. The additional operating portion may allow the  
15 tool to provide an additional function in the casing or  
16 liner. Preferably the additional operating portion is a  
17 packer as is known in the art, the packer being arranged  
18 above the sleeve on the body. The tool is then a packer  
19 including a sacrificial scraper mounted ahead of the  
20 packer.

21  
22 Alternatively the additional operating portion may be a  
23 cementing unit as is known in the art, the unit being  
24 arranged above the sleeve on the body. Thus the tool is a  
25 wiper plug wherein the blades provide a barrier between  
26 the cement slurry below and the displacing fluid above.

27  
28 According to a second aspect of the present invention  
29 there is provided a holding device for preventing  
30 longitudinal movement of a sleeve(s) on a substantially  
31 cylindrical tool body, the device comprising a split  
32 ring, a retaining ring and a circlip.

1 The holding device advantageously transfers the load of  
2 the sleeve on to the tool body. The holding device may be  
3 located around the body and abuts the sleeve.

4

5 Preferably the split ring preferably comprises two  
6 semicircular members. The split ring may rest against an  
7 end of the sleeve and bears the load of the sleeve.

8

9 Preferably the retaining ring comprises a circular member  
10 including a circular groove located at a first end  
11 thereof. More preferably the split ring locates in the  
12 groove such that the split ring is retained by the  
13 retaining ring.

14

15 Preferably the circlip is located at a second end of the  
16 retaining ring. The circlip holds the retaining ring in  
17 place and bears no load from the sleeve. By taking the  
18 load of the sleeve on the split ring, this load is  
19 transferred to the body.

20

21 According to a third aspect of the present invention  
22 there is provided a method of conditioning a casing or  
23 liner in a well bore, the method comprising the steps:

24

- 25 (a) locating on a work string, a blade having a  
26 circular peripheral edge and made from a  
27 composite material which comprises a polymeric  
28 fibre;  
29 (b) inserting the work string into the well bore to  
30 a position where the peripheral edge makes  
31 contact with an inner wall of the casing or  
32 liner; and



1 (c) moving the work string relative to the inner  
2 wall to thereby move the blade relative to the  
3 wall and provide a grooming action on the wall.  
4

5 Step (c) may be by rotation of the work string, by  
6 running in the well or by pulling out of the well. In a  
7 preferred method the blade may move independently of the  
8 work string.  
9

10 Step (b) may include making 360 degree contact between  
11 the peripheral edge and the inner wall.  
12

13 Preferably the method may include the step of providing a  
14 fluid bypass to allow fluid to bypass the peripheral  
15 edge.  
16

17 Embodiments of the present invention will now be  
18 described, by way of example only, with reference to the  
19 following drawings of which:  
20

21 Figures 1(a) and (b) are illustrative views of a body (a)  
22 and tool(b) of a downhole tool according to an embodiment  
23 of the present invention;  
24

25 Figures 2(a) and (b) are cross-sectional views through  
26 the tool of Figure 1;  
27

28 Figures 3(a)-(h) are cross-sectional views through a  
29 downhole tool according to a further embodiment of the  
30 present invention;  
31

32 Figure 4 is a cross-sectional view through a portion of  
33 the tool of Figure 3;

1  
2 Figures 5(a) and (b) are schematic diagrams of a holding  
3 device according to an embodiment of the present  
4 invention; and

5  
6 Figure 6 is a schematic view of a tool, according to an  
7 embodiment of the present invention, operating in a well  
8 bore.

9  
10 Reference is initially made to Figure 1(b) of the  
11 drawings which illustrates a downhole tool, generally  
12 indicated by reference numeral 10, according to an  
13 embodiment of the present invention. Tool 10 primarily  
14 comprises a substantially cylindrical body 12, best seen  
15 in Figure 1(a), and a sleeve 14 on which is located six  
16 blades 16a-f.

17  
18 The body 12 is of single piece hollow bore construction  
19 and includes a threaded section 18 at a first end 20 of  
20 the tool 10 and a box section 22 at a second end 24 of  
21 the tool 10. The threaded section 18 and box section 22  
22 are as typically used to connect the tool to a mandrel in  
23 a work string (not shown). The body 12 includes an outer  
24 surface 26 on which is located a ledge 28 formed  
25 circumferentially around the body 12. Ledge 28 provides a  
26 stop on the body 12. At a central location 30 four  
27 channels 32, of rectangular shape are arranged  
28 longitudinally on the surface 26. Further on the surface  
29 30 are arranged two further circumferential grooves 34, 36  
30 for holding split rings (not shown) and a circlip 38.

31

1 In order, on the body 12, are arranged from the ledge 28,  
2 a number of components, each separated by bearing rings  
3 40a-d so that the components are through rotational.

4

5 The first component is a centraliser 42a which is a  
6 sleeve including longitudinally arranged raised portions  
7 44. Four raised portions 44 are arranged equidistantly  
8 around the centraliser 42a to evenly space the tool 10  
9 from the wall of a casing or liner in which the tool 10  
10 is inserted.

11

12 A middle component is the sleeve 14 on which is located a  
13 blade cartridge 46. The blade cartridge 46 holds the six  
14 equally spaced blades 16a-f. Each blade is a torus of  
15 KEVLAR®/carbon/glass fibre composite, with an outer  
16 diameter greater than the diameter at the raised portions  
17 44 of the centralisers 42. The material provides a  
18 flexibility so that the blades 16a-f can fit within close  
19 sized casing or liner, while being strong enough to  
20 scrape and remove debris as the edge 48, contacts the  
21 casing or liner wall.

22

23 Though KEVLAR® is the preferred choice of polymeric  
24 fibre, it will be appreciated that other fibres such as  
25 polyaramid fibres including poly-paraphenylene  
26 terephthalamide commonly referred to by its trade name  
27 Twaron®; polyethylene fibres including those commonly  
28 referred to as Dyneema® or Spectra®, polypropylene  
29 fibres, polyacryl fibres, polyester fibres including  
30 those commonly referred to as Diolen®; polyacryl fibres;  
31 or poly{2,6-diimidazo[4,5-b4',5'-e]pyridinylene-1,4(2,5-  
32 dihydroxy)phenylene} (PIPD) fibres commonly referred to  
33 as M5®.

1  
2 The blades 16a-f are spaced by rubber rings 50 which  
3 provide a degree of flexibility to the movement of the  
4 blades 16a-f. It will be appreciated however that the  
5 blades need not be equally spaced nor the rings be of  
6 rubber, any material providing a degree of flexibility  
7 would be appropriate.

8  
9 Through the rings 50 are arranged ports which include  
10 nozzles 54 to jet fluid from behind the cartridge 46 onto  
11 the blades 16a-f to provide a cleaning action and remove  
12 any debris or particles which have become stuck to the  
13 surface of the blades 16a-f. Further the sleeve 14 is  
14 made in three parts 56a,b,c. The parts are screwed  
15 together to form circularly arranged ports 58a,b through  
16 which fluid can pass from the casing or liner to the  
17 channels 32 in the body 12. Ports 58a,b are large slots  
18 to provide an unobstructed flow path through the tool 10  
19 when the blades 16a-f are sealingly engaged to the wall  
20 of the casing or liner. Thus removal of debris will  
21 continue successfully even if debris builds up behind or  
22 in front of a blade because it is the circumference of  
23 the blade that knocks off the debris which is independent  
24 of any debris build up. The arrangement of this bypass  
25 will be described hereinafter with reference to Figures  
26 2.

27  
28 The third and final component is a second centraliser  
29 42b, identical to the first centraliser 42a. The  
30 centralisers 42a,b stabilise the tool 10 within the  
31 casing or liner to drift.

32

1 All the components are held between the ledge 28 and  
2 split rings (not shown). The split rings are held within  
3 a retaining ring 60 which in turn is held by the circlip  
4 38. All the components are through rotational so that  
5 they can remain static while the body 12 and the mandrel  
6 to which it is attached can rotate in the well bore. The  
7 split ring/retainer ring 60 and circlip 38 arrangement is  
8 described hereinafter with reference to Figures 5.

9  
10 Reference is now made to Figures 2 of the drawings which  
11 shows the central portion 30 of the tool 10 of Figure  
12 1(b). Like parts have been given the same reference  
13 numeral to maintain clarity. Ports 56 locate over the  
14 channels 32 to provide a fluid bypass under the blades  
15 16a-f. The fluid bypass is bi-directional and thus can  
16 redirect fluid when the tool 10 is run in, pulled out or  
17 if fluid is circulated or reverse circulated in the  
18 casing or liner.

19  
20 Also shown in Figures 2 are the arrangement of the blades  
21 16a-f with respect to the body 12 of the tool 10. As  
22 described previously, blades 16a-f are a torus or 'do-  
23 nut' shape having an outer peripheral edge 48 and an  
24 inner circumferential edge 62. The diameter at the edge  
25 62 is greater than the diameter at the surface 64 of the  
26 cartridge 46. In this way the blades 16a-f can float on  
27 the sleeve 14 by being able to move perpendicularly to  
28 the longitudinal axis of the tool 10. At all times,  
29 however, a portion of the blade 16 remains within the  
30 ring 50. The blades 16a-f float independently of each  
31 other. If the tool 10 is used in a deviated or horizontal  
32 well bore, there will be a tendency for the tool 10 to  
33 rest on the low side of the casing or liner. The blades

1 16 would therefore have to bear the weight of the tool 10  
2 and the work string. In order to prevent this the blades  
3 or the blade cartridge float to remain concentric to the  
4 casing or liner and allow the centralisers 42a,b to  
5 support the weight of the tool 10.

6  
7 Reference is now made to Figure 3 and 4 of the drawings  
8 which illustrates a downhole tool, generally indicated by  
9 reference numeral 110, according to a further embodiment  
10 of the present invention. Like parts to those of the  
11 embodiment described in Figures 1 and 2, have been given  
12 the same reference numeral with the addition of 100. Tool  
13 110 has the same components as tool 10 but they are  
14 arranged differently on the body 112.

15  
16 Body 112 has two ledges 66a,b located on the outer  
17 surface 126. Against one ledge 66b is located a  
18 centraliser 142b which is held in place by split rings 64  
19 and a retaining ring 160b. The split ring 64b is of two  
20 part construction as is known in the art. The retaining  
21 ring 160b can either screw on to the body 112 or can in  
22 turn be held in place by a circlip (not shown). From the  
23 second ledge is arranged the sleeve 114 with a second  
24 centraliser 142a abutted thereto. The second centraliser  
25 142a is held in place by an identical split ring 64a and  
26 retaining ring 160a arrangement as the first centraliser  
27 142b.

28  
29 Sleeve 114a is made up of three parts 156a,b,c. This is  
30 best seen with the aid of Figure 4. Central section 156b  
31 also carries the cartridge 146 on which the blades 116  
32 are mounted. In this embodiment the blades 116 are  
33 mounted in two sets of three. By tightly stacking the

1 blades 116 against the rubber rings 150, each set  
2 provides a strength equal to a single blade having triple  
3 the thickness but still has the flexibility afforded to  
4 the thinner blades 116. And pieces 156a,c include  
5 rectangular ports 158 to provide for fluid flow into the  
6 channels 132. The portions 156 of the sleeve 114 are  
7 further held in place by an additional split ring 64c  
8 located between the central 156b and outer 156a parts.

9

10 Reference is now made to Figures 5 of the drawings which  
11 illustrates a holding device, generally indicated by  
12 reference numeral 68, according to a further embodiment  
13 of the present invention. Holding device 68 is as used in  
14 the tool 10 and like parts to those in Figures 1 and 2  
15 have been given the same reference numeral with the  
16 addition of 200. The device comprises a split ring 264, a  
17 retaining ring 260 and a circlip 238.

18

19 On the tool body 212 are arranged two circumferential  
20 grooves 234,236. Facing the sleeve (not shown) is  
21 arranged the split ring 264 in the first groove 234. The  
22 split ring is made of two semi-circular portions which  
23 compress against the body 112 when an inner surface 70 of  
24 the retainer ring 260 is pushed against them. The  
25 retainer ring 260 is held against the split ring 264 by  
26 the circlip 238 which itself locates in the second groove  
27 236. It is the split ring 264 which bears the load of a  
28 sleeve abutting the holding device 68. This load is  
29 transferred to the body 212 through the split rings 264.  
30 Thus no load appears on the circlip 238, it merely keeps  
31 the retaining ring 260 in place.

32

1 In use, a blade 16,116, is chosen which is equal to or  
2 slightly greater than the diameter of the casing or liner  
3 which requires to be groomed. The blades 16,116 are  
4 arranged on the blade cartridge 46,146 and mounted on the  
5 sleeve 14,114. The sleeve 14,114 and the centralisers  
6 42,142 are located on the body 12,112 and held in place  
7 by the holding device 68 if used. The body 12,112 is then  
8 connected to the mandrel of a work string using the box  
9 22,122 section and threaded 18,118 section at each end  
10 24,20 of the tool 10,110. The work string is run in the  
11 well bore until the blades reach the location of the  
12 casing or liner to be groomed. The work string is then  
13 moved relative to the casing or liner and as the edges 48  
14 contact the wall of the casing or liner, debris and  
15 particles will be 'knocked-off'. Additionally through the  
16 sealing engagement of the blades 16,116 to the wall, the  
17 surface of the wall will be effectively wiped clean.  
18 During this process fluid within the casing or liner will  
19 pass freely through the tool 10,110 by entering the ports  
20 58a,158a, passing through the channels 32,132 and exiting  
21 through the ports 58b,158b. It will be appreciated that  
22 fluid can flow in the opposite direction through the  
23 ports 58,158 also.

24  
25 Reference is now made to Figure 6 of the drawings which  
26 illustrates a downhole tool, generally indicated by  
27 reference numeral 80, including the tool 10,110 of the  
28 present invention. Tool 80 has a first operating section  
29 82 which contains the known components for performing a  
30 function within casing or liner 84. Those skilled in the  
31 art will appreciate that section 82 may be a packer,  
32 cementing tool or the like which all require to contact  
33 the inner surface 86 of the casing or liner 84. The



1 second operating section 88, mounted ahead of the first  
2 operating section 82, on the work string 90, is the tool  
3 10,110 as described previously herein. In use, tool 80  
4 provides a grooming function to condition the surface 86  
5 ahead of operation of the section 82.

6  
7 The principal advantage of the present invention is that  
8 it provides a downhole tool for conditioning, by  
9 grooming, the inner wall of a casing or liner which  
10 utilises a composite material which comprises a polymeric  
11 fibre. This composite provides a flexibility and strength  
12 over the prior art blade materials of metal and rubber.

13  
14 A further advantage of the present invention is that it  
15 provides a downhole tool wherein the individual blades  
16 provide 360 degree coverage so that the tool can be used  
17 when run in or pulled out of a well bore. Further fluid  
18 bypass is provided to maintain fluid circulation in the  
19 well bore.

20  
21 It will be appreciated by those skilled in the art that  
22 various modifications may be made to the invention  
23 hereindescribed without departing from the scope thereof.  
24 For example, any number of sleeve including the blades  
25 may be mounted on a body. Additionally, the blades could  
26 be fixed to the sleeve i.e. not floating, but be non-  
27 concentric with the work string, either individually or  
28 together. It will also be appreciated that while the  
29 blades in the Figures are shown as individual circular  
30 discs, a strip of composite arranged in a spiral around  
31 the sleeve could also be used, thereby reducing the need  
32 for the separate by pass.



Centralisers and blade cartridge are through rotational

All parts slid onto body and retained by circlip split ring

By-pass section under blade cartridge

Circlip and split ring grooves

Body

(a)

(b)

Circlip and split ring in gun barrel

Fluid by-pass slots for optional clean blades

Blade cartridge assembly screwed on (blue parts). Dark parts are blade spacers

By-pass sections in them

Bearing rings between components

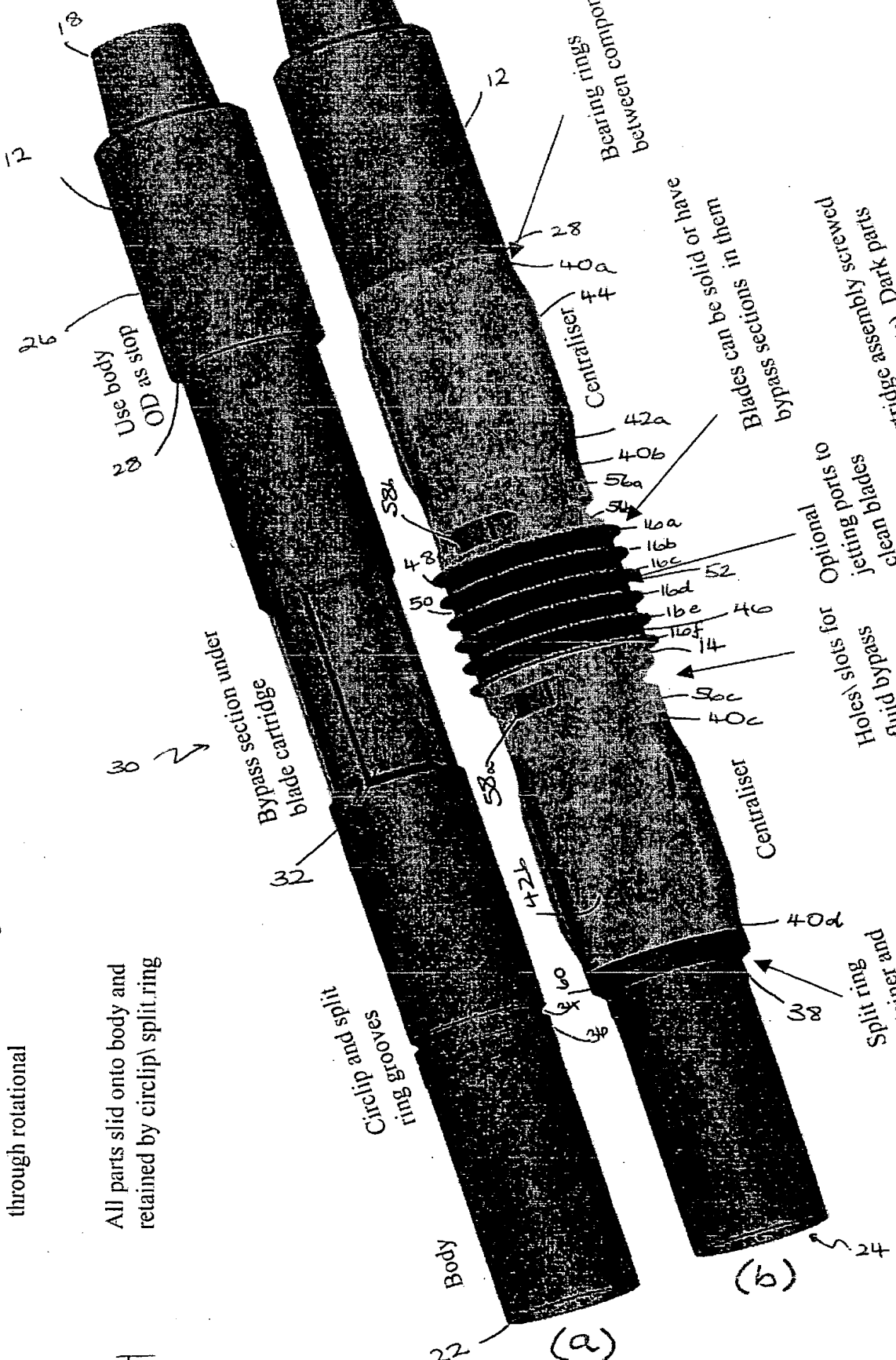
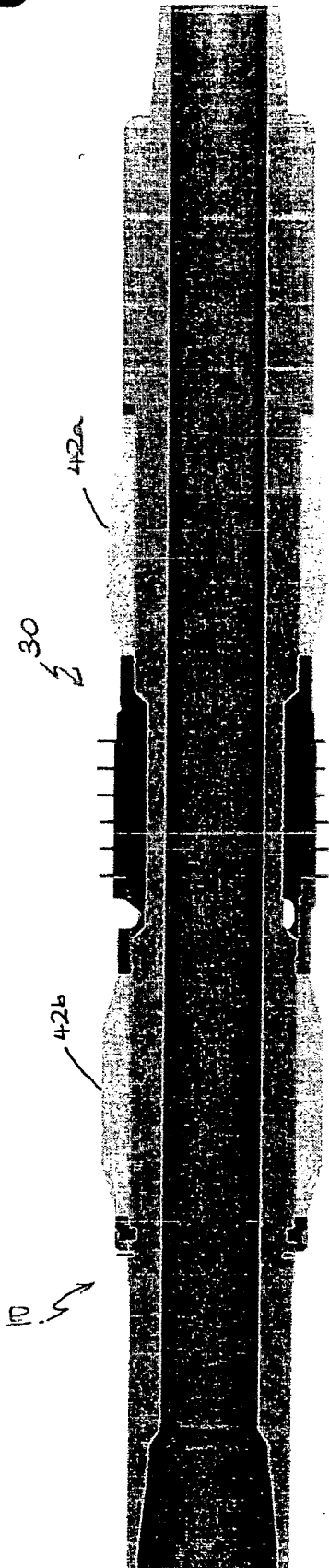
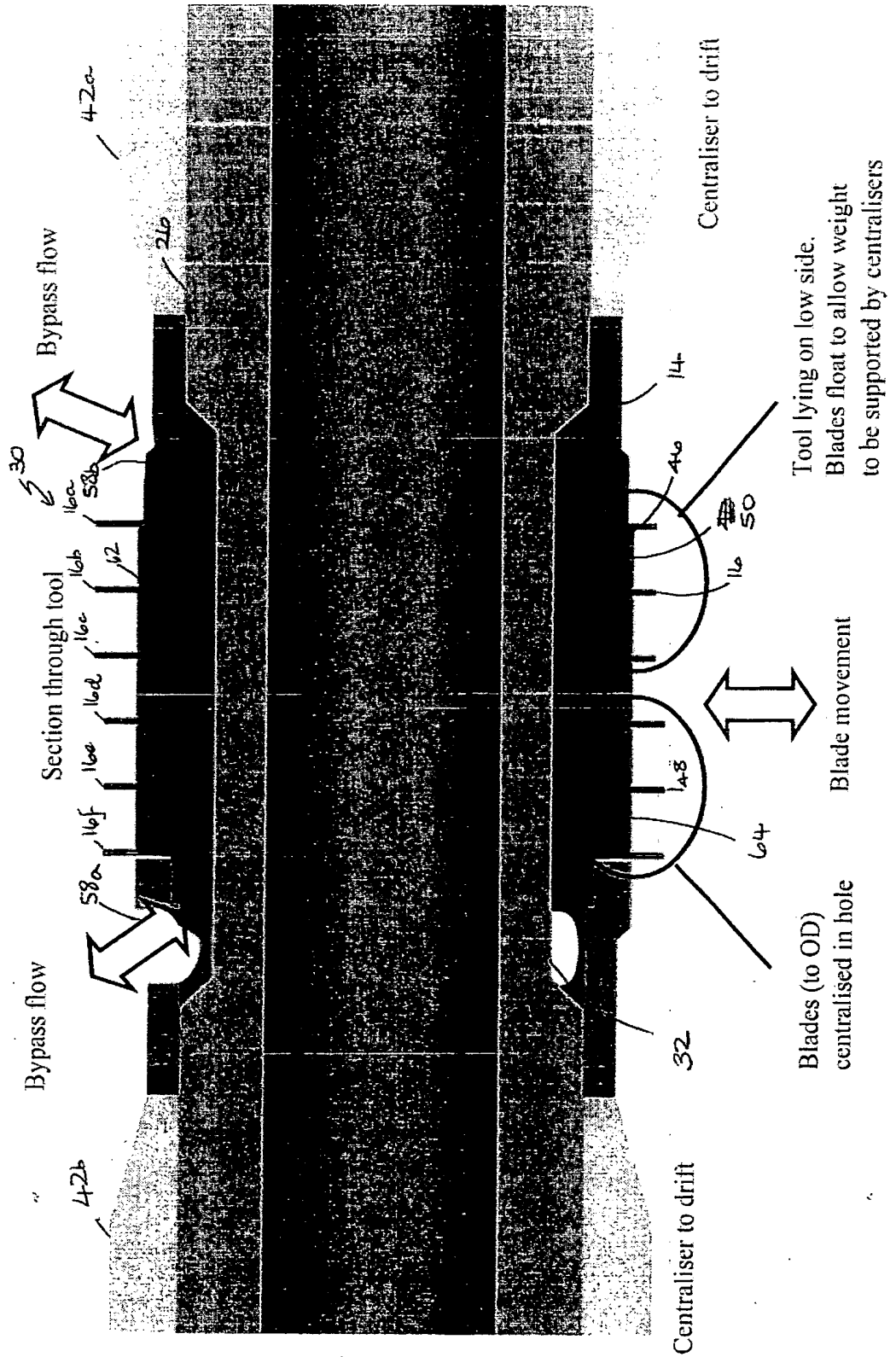


FIGURE 1





(a)

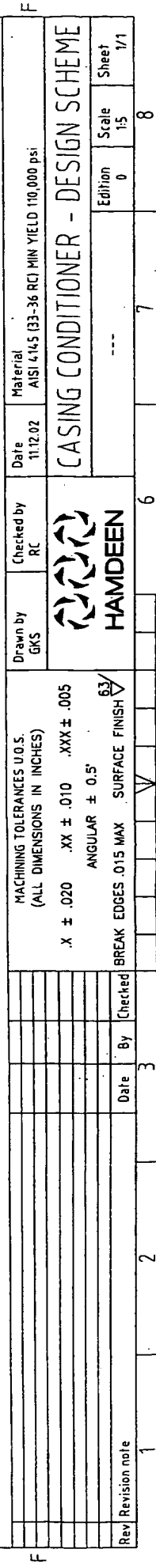


(b)

FIGURE 2.



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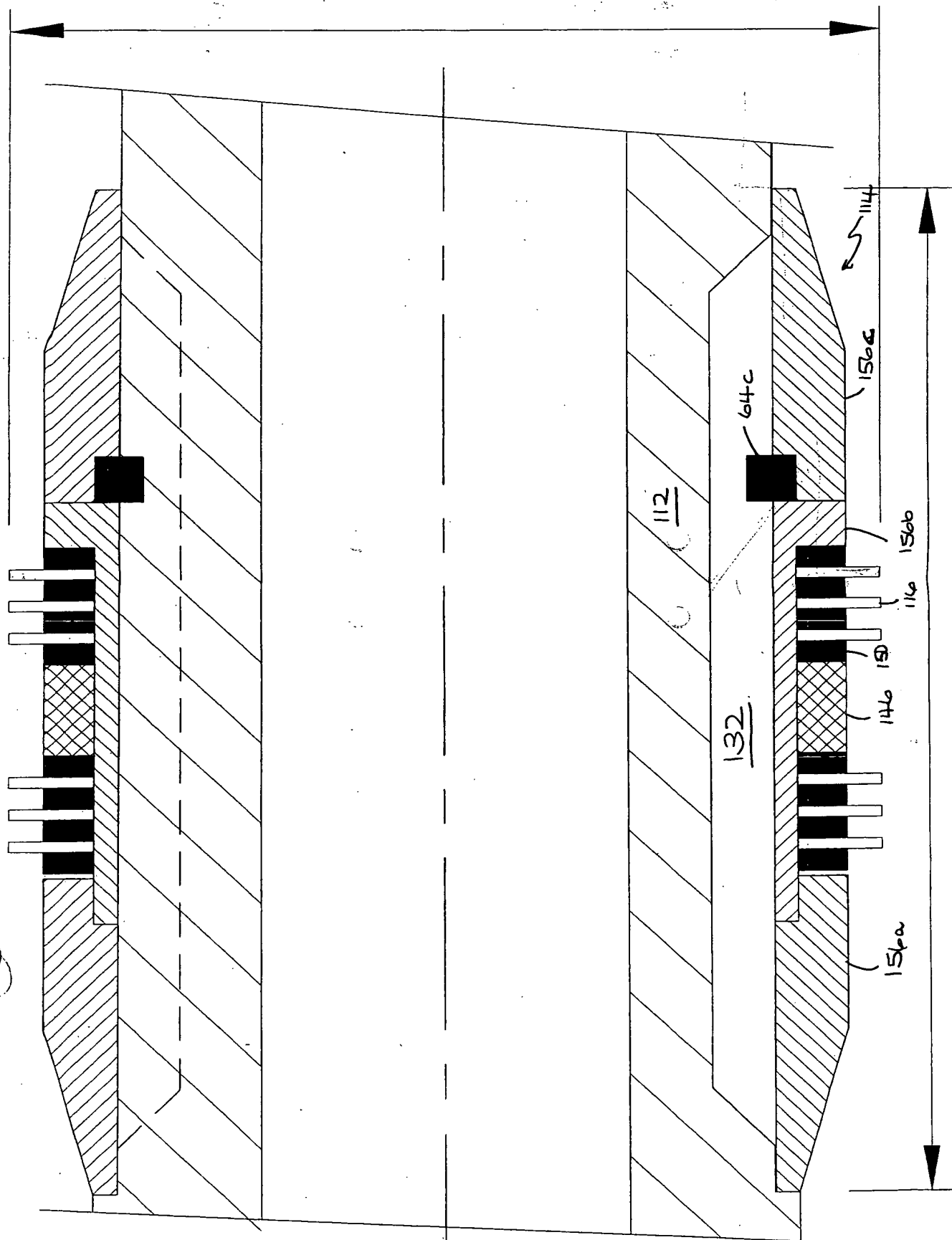






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FIGURE 4







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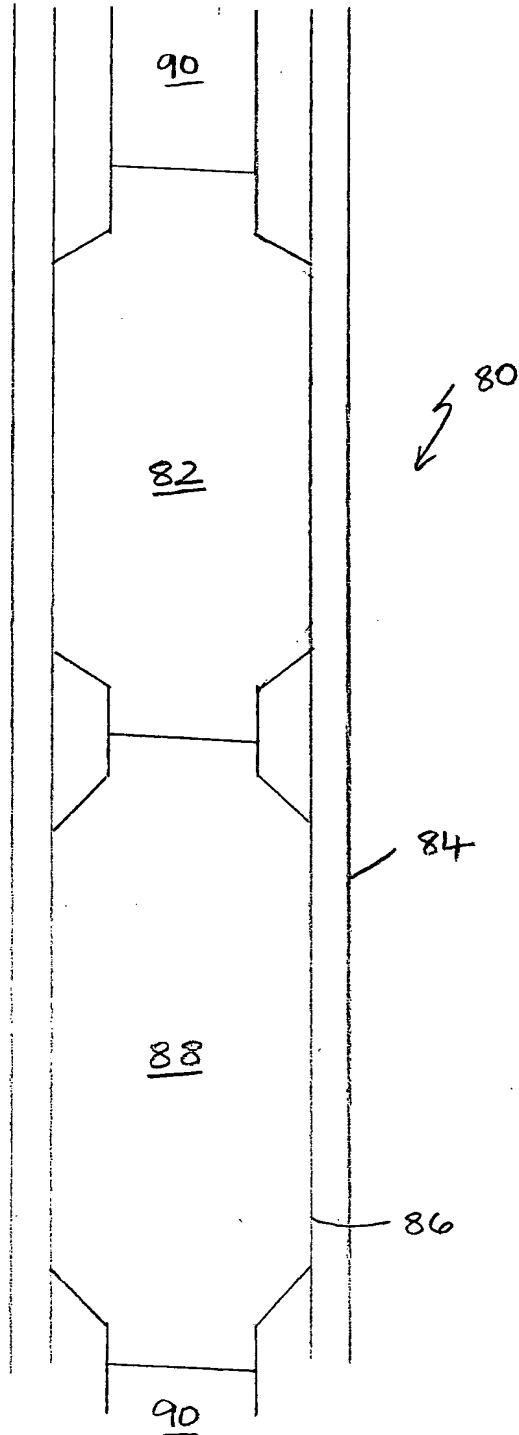


FIGURE 6

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U.S. Patent Application No. 10/781,937  
Filing Date: February 20, 2004  
GAU: 3672 Confirmation No. 9705  
Title: DOWNHOLE TOOL  
Inventor: Richard Keith BOOTH  
Docket No. KC-0110  
Customer No. 34610